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BEHAVIORAL AND LEARNING DISABILITIES ASSOCIATED WITH COGNITIVE-MOTOR DYSFUNCTION. INTERIM REPORT.

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THIS REPORT EXAMINES THE RELATIONSHIP BETWEEN BEHAVIORAL AND ACADEMIC DISABILITIES AND COGNITIVE-MOTOR DYSFUNCTION AS REVEALED BY DATA ON 400 ELEMENTARY SCHOOL CHILDREN. THE BEHAVIOR CHECKLIST WAS USED AS A BASIS FOR SAMPLE SELECTION. BEHAVIOR CLUSTERS REFLECTING BOTH ANTI-SOCIAL TENDENCIES AND UNASSERTIVE, WITHDRAWN BEHAVIOR WERE IDENTIFIED. A BATTERY OF TESTS WAS DEVELOPED FOR MEASUREMENT OF NINE COGNITIVE-MOTOR DIMENSIONS AND ADMINISTERED TO 198 MALADJUSTED CHILDREN AND 200 NORMAL SUBJECTS. THE DISTRIBUTION OF SCORES FOR THE MALADJUSTED CHILDREN WAS BIMODAL. ONE SUBGROUP SHOWED MINIMAL DIFFICULTY. THE SUBGROUP GAVE EVIDENCE OF POOR FUNCTIONING. A COMPARISON OF HIGH AND LOW DYSFUNCTION EXPERIMENTAL SUBJECTS ON BEHAVIOR RATINGS SUGGESTS A RELATIONSHIP BETWEEN CERTAIN TYPES OF BEHAVIOR MALADJUSTMENT, ESPECIALLY DISORIENTED BEHAVIOR, AND COGNITIVE-MOTOR PERFORMANCE. INDIVIDUALS SHOWING BOTH BEHAVIOR MALADJUSTMENT AND ACADEMIC RETARDATION DO POOREST ON TESTS OF COGNITIVE MOTOR FUNCTIONING. (PS)

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Detroit, Michigan

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BEHAVIORAL AND LEARNING DISABILITIES ASSOCIATED WITH COGNITIVE-MOTOR DYSFUNCTION

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The identification and description of the child handicapped in learning and behavior at school remains a vexing problem. Diagnostic approaches have suggested such labels as emotionally disturbed, learning disability, hyperkinesis, perceptual handicap, or minimal brain dysfunction. Most often such categories are defined by the method of measurement reflecting the overly narrow theoretical bias of the investigator. Sometimes a child is defined as emotionally disturbed only when other examinations such as those with mental subnormality or organic deficits are negative. The designation "learning disability" does not do justice to the problem by virtue of its vagueness and its over-inclusiveness. Perceptual handicap or language disturbance have limitations because they tend to focus on only partial segments of behavior. Minimal brain dysfunction seems to be more inclusive but oftentimes fails to give adequate descriptive information and has the implication of being identical to organic deficit, defined by neurological examination.

School personnel continue to be faced with the child's inability to function adaptively and need help in understanding the disabilities in terms that are relevant to the methods available to them for intervention and remediation. Study of a large sample of maladjusted children in a school system suburban to Detroit afforded the present investigators an opportunity to delineate some of the characteristics of children who failed to adapt in learning and behavior in school as well as to provide an approach to determine some immediate causative factors leading to better diagnostic and remediation methods potentially useful to both schools and clinics [10]. This first report on that study is concerned with the relationship of behavioral and academic disabilities to cognitive-motor dysfunction as revealed by data on 400 children drawn from grades 1, 2, 3, and 5.

Presented at the Annual Meeting, American Orthopsychiatric Association, Washington, D.C., March, 1967

THE LAFAYETTE CLINIC COGNITIVE-MOTOR RESEARCH PROJECT

PREVIOUS STUDIES

Findings from the Wyandotte Study(6) (8), an experiment to evaluate the usefulness of special class programming for emotionally disturbed children in public schools, indicated that classification of children in clinically descriptive categories such as anxious, immature, minimally brain damaged and withdrawn, failed to reveal significant differences among the groups so described related to improvement or useful for programming. Information useful for theory construction and educational planning was obtained, however, from the use of the Behavior Checklist, a rating instrument utilized by the teacher to reflect the kinds of symptoms demonstrated by maladjusted children. The teacher may indicate intensity of problem behavior by checking each item once (present), twice (frequent), or three times (very frequent). These teacher observations were for the most part validated by subsequent psychiatric, psychological, neurological and EEG examinations, identifying the subjects as showing moderate to severe degree of emotional disturbance. A factor analysis of the behavior symptoms reflected on the Behavior Checklist revealed seven psychologically meaningful clusters, with 75% of the variance accounted for by the first three factors. (Figure 1). Children who demonstrated the most improvement from special class placement were those who showed characteristics reflected by Factor I, Disoriented Behavior, and also revealed evidences on psychological testing suggestive of cognitive-motor dysfunction. These findings led to the hypothesis that a significant percentage of children identified as maladjusted at school would show evidences of cognitive-motor dysfunction predisposing the child to academic difficulty and behavioral maladjustment.

SELECTION OF SAMPLE

In selecting the sample for the current study, the Behavior Checklist was repeated using a different school system with essentially similar results. In 1966, teachers rated 4,500 children representing the total population of grades 1, 2, 3, and 5, in the Roseville Public Schools. Of this number, 2,636 checklists with one or more items checked were utilized for a repeat of the factor study. The current sample is a more diverse group than the Wyandotte Study

BEHAVIOR CHECKLIST FACTORS

FACTOR I -- Disorientation and Maladaptation to the Environment

Item	Symptom	Loading
28.	Misinterprets simple statements	+.70
29.	Disoriented in space	+.70
12.	Daydreams	+.65
26.	Makes odd noises	+.63
15.	Poor coordination	+.61
8.	Short attention span	+.56
20.	Messy with work and belongings	+.56
9.	Can't work independently	+.55
27.	Makes irrelevant remarks	+.54
22.	Difficulty in handling materials	+.48
10.	Shows signs of nervousness	+.41

FACTOR II -- Antisocial Behavior

31.	Tends toward primitive hostility	+.68
21.	Negativistic	+.67
2.	Feelings of inadequacy	+.48
33.	Antisocial tendencies	+.46

FACTOR III -- Unassertive, Over-conforming Behavior

13.	Fear of being assertive	+.78
32.	Holds back in free play	+.70
24.	Much solitary play	+.55
23.	Considered isolate in class	+.52
5.	Overconforms to rules	+.44
19.	Tends toward enuresis or soiling	+.44

FACTOR IV -- Neglect

34.	Frequently tardy or absent	+.74
35.	Poorly cared for before school	+.65
37.	Often ill	+.42

FACTOR V. -- Infantile Behavior

25.	Displays infantile behavior	+.47
1.	Very sensitive to criticism	+.43
36.	Easily fatigued	+.43

FACTOR VI -- Immature Social Behavior

16.	Can't take turns	+.67
18.	Resists limits or rules	+.64
7.	Seeks attention excessively	+.55

FACTOR VII -- Irresponsible Behavior

6.	Aggressive in underhanded ways	+.57
17.	Lacks responsibility for self	+.53

UNIQUE FACTORS

3. Never makes self known.
4. Excessively neat.
11. Overpreoccupied with sex.
14. Speech correction.
30. Excessive fantasy.
38. Feigns illness.
39. Over or under achievement.

Reference: Emotionally Handicapped Children and the Elementary School. Eli Z. Rubin, Clyde Simson and Marcus Betwee, Wayne University Press, 1966.

sample in that it includes those with minimal disturbances as well as those with moderate to severe maladjustment. The current sample from the 1st and 2nd grades is most comparable in age to the initial study group.

From Table I we can get some estimate of the prevalence of problem behavior as seen by the teacher. Using a criterion of 8 or more items checked on the Behavior Checklist as a definition of maladjusted behavior, we note that 373 subjects are located for these four grades. The estimates of the prevalence of school maladjustment reported in this table range from 2.7 to 14.6%. As has been reported previously[11], incidence of mental disorder in children has been difficult to estimate and previous studies have reported a range from 2 to 12%. The inclusion of mild cases utilizing this criterion undoubtedly inflates the figures as it cannot be assumed that all of the children in the sample will continue to show behavior or learning problems, delinquency or mental illness. In order to select a sample for this study who were showing the most severe behavior problems, more stringent criteria were utilized in the selection of the 200 maladjusted subjects. The last column of Table I indicates the numbers and percentages of cases chosen for the present study. We selected male subjects who showed at least 8 symptoms with at least 3 or 4 of these rated "very frequent". It was necessary to reduce these criteria in order to select a sufficient number of girls. Our final experimental sample represents on the average the lowest 4.4% of the school populations from these grades with respect to behavior symptoms. Two experimental children were ultimately eliminated from the final results because of I.Q. scores below 81, which was used as a criterion for exclusion.

The control group consisted of an equal number of subjects, drawn from the same grades but showing no behavior symptoms, and who had not repeated a grade nor had been referred to any agency or clinic for problem behavior.

PATTERNS OF MALADJUSTMENT

The findings from the factor analysis of the items from the Behavior Checklist include behavior indicators of poor coordination and poor perceptual awareness in addition to the anti-social and withdrawn symptoms (Figure 2), found in similar factor analytic studies[3] [4] [5] [12]. This new factor, not identified in studies of other workers, indicates

Table 1.

DESCRIPTIVE DATA ON TOTAL ROSEVILLE SAMPLE

Grade	Total Sample		No. of Subjects 1 or More Symptoms		Problem Group 8 or More Symptoms No.	% of Total No.	Final Study Sample * No.	% of Total Sample
1st	M 659		468		82	12.4	30	4.6
	F 591		346		38	6.4	20	3.4
	T	1250		814	120			
2nd	M 562		369		82	14.6	30	5.3
	F 538		275		35	6.5	20	3.7
	T	1100		644	117			
3rd	M 545		358		56	10.3	30	5.5
	F 556		263		17	3.1	20	3.6
	T	1101		621	73			
5th	M 527		322		49	9.3	30	5.7
	F 520		235		14	2.7	20	3.8
	T	1047		557	63			
TOTALS		4498		2636	373	8.3	200	4.4

* Grade 1, 2 males - 8 or more items, 4 or more items checked, 3 times
" 3 " - 8 or more items, 3 or more items checked, 3 times
" 5 " - 8 or more items, 4 or more items checked, 2 times
Grade 1, 2 females - 8 or more items, 3 or more items checked, 2 times
" 3, 5 " - 6 or more items, 3 or more items checked, 2 times

Figure 2

A Summary of Behavior Checklist Factors for Grades 1, 2, 3, and 5

FACTORS	GRADE 1	GRADE 2	GRADE 3	GRADE 5
I.	M - Disoriented-General F - Disoriented-Attention	Anti-social-Immature Disoriented-General	Anti-social-Immature Anti-social-General	Unassertive-Fearful Disoriented-Attention
II.	M - Anti-social-Immature F - Unassertive	Disoriented-General Unassertive-Fantasy	Unassertive-Fearful Unassertive-Fearful	Anti-social-Immature Unassertive-Fearful
III.	M - Unassertive-Sensitive F - Anti-social	Unassertive-Sensitive Neglect	Disoriented-Attention Unassertive-Fantasy	Disoriented-Attention Anti-social-Immature
IV.	M - Unassertive-Ill F - Disorient.-Poor Coord.	Unassertive-Fearful Aggressive-Immature	Neglect Anti-social-Immature	Disoriented-Poor Coord. Disoriented-Poor Coord.
V.	M - Unassertive-Fantasy F - Anti-social-Immature	Neglect Nervous	Disoriented-Attention Disoriented-Poor Coord.	Unassertive-Inadeq.

disorientation on the part of the subjects, reflecting some inability either to receive, comprehend or assimilate incoming stimuli, or to make appropriate or controlled motor responses. This disorientation factor is the first general factor for the first grade population for both boys and girls and occurs with relatively high loadings in the other grades as well. The Behavior Checklist items making up this first factor for grade 1 boys are presented in Figure 3. The data from this analysis suggests that although it is possible to identify clusters of behavior that reflect both anti-social tendencies as well as unassertive and withdrawn behaviors, there is a prepotent dimension reflecting disorientation that appears to characterize maladjusted school children, especially in the early grades. This finding is essentially a confirmation of a similar result in the Wyandotte Project which led to the development of the view that there were many children maladjusted in school whose disturbance in adjustment was probably a secondary result of their inability to cope with the demands at school because of limited cognitive-motor skills. In a previous report(9) it was suggested that children with inadequately developed cognitive-motor skills react to a variety of developmental tasks and life experiences as stressful, experience negative feedback due to their inability to master a variety of experiences and adopt inadequate methods of coping behavior. It was proposed that such types of reaction may be considered secondary emotional disturbances reflecting the vulnerability of such children to the demands of school and other life situations(7). Our research has been directed toward determining if maladjusted children did differ from problem-free subjects on cognitive, perceptual or motor tasks.

MEASUREMENT OF COGNITIVE-MOTOR DYSFUNCTION

In a previous report(1) the authors have described some basic cognitive-motor dimensions, proposing methods of measurement for each. In order to test our hypothesis, a battery of tests, along nine dimensions, including visual, auditory, tactile and kinesthetic perception, verbal and non-verbal integration, fine motor control, etc., was applied to 198 maladjusted children (experimental) and 200 problem-free subjects (control) in order to identify those children showing major cognitive-motor dysfunction. A total of 35 tests from which 58 scores were derived was utilized.

In order to examine the predictive power of these procedures for each grade sample, a criterion score was

Figure 3

Factor I - Disoriented Behavior

First Grade Males

Behavior Checklist

Item No.	Name	Loading
9.	Can't work independently	.806
8.	Short attention span	.779
29.	Disoriented in space	.669
28.	Misinterprets simple statements	.591
22.	Difficulty in handling material	.566
15.	Poor coordination	.452
2.	Expresses feelings of inadequacy	.412
12.	Daydreams	.406

determined for each discriminating test or sub-test, separately for each grade, based on the mean and standard deviation of the total distribution for each grade group. For example, 24 scores or 41% of the total, differentiated significantly between experimental and control groups in the first grade. Of that number all but one of the nine dimensions were represented by one or more scores. All subjects' obtained scores were compared to the criterion, indicating as an error score those that fell below this criterion. The total number of error scores was designated the cognitive-motor dysfunction score for each subject. The distribution of these scores for experimental and control groups for all grades is represented in Figure 4.

DISCUSSION OF RESULTS

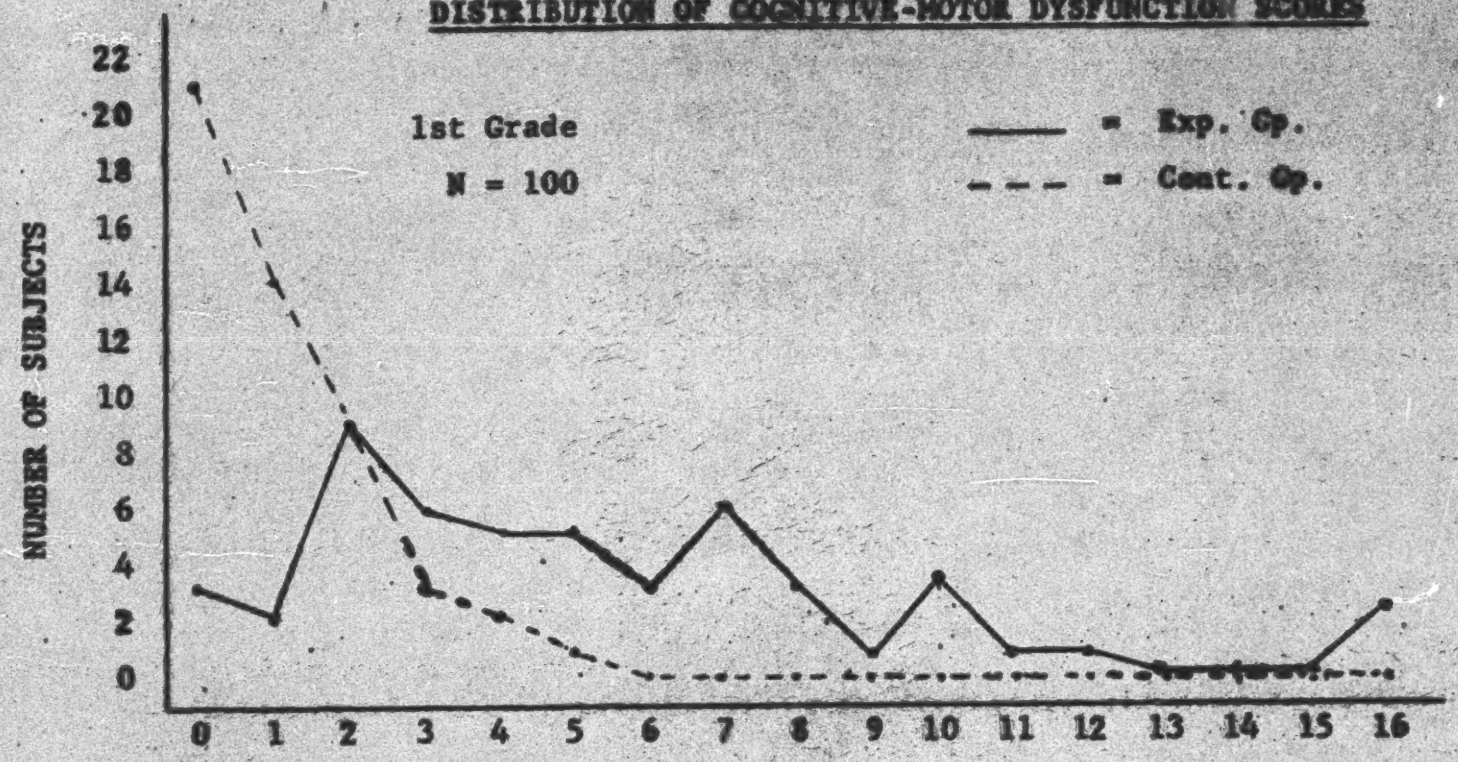
The distribution of cognitive-motor dysfunction scores for the control or problem-free groups indicate that most all of these subjects obtain less than 5 error scores, thus showing minimum difficulty with tasks involving cognitive-perceptual-motor functioning. The distribution of cognitive-motor dysfunction scores for the poor adjustment group are bimodal. One subgroup also shows minimum difficulty with cognitive-motor tasks, scoring poorly on 5 or less tests. A second group, however, gives evidences of very poor functioning on these tests. Using an error score of 6 or more as the criterion for the first three grades, 40% of the 1st and 3rd grade and 49% of the 2nd grade experimental groups are clearly distinguished from the rest of the sample of children showing behavior maladjustment. Forty-two percent of the 5th grade experimental group have error scores of 5 or more whereas none of the control group subjects score above 4.

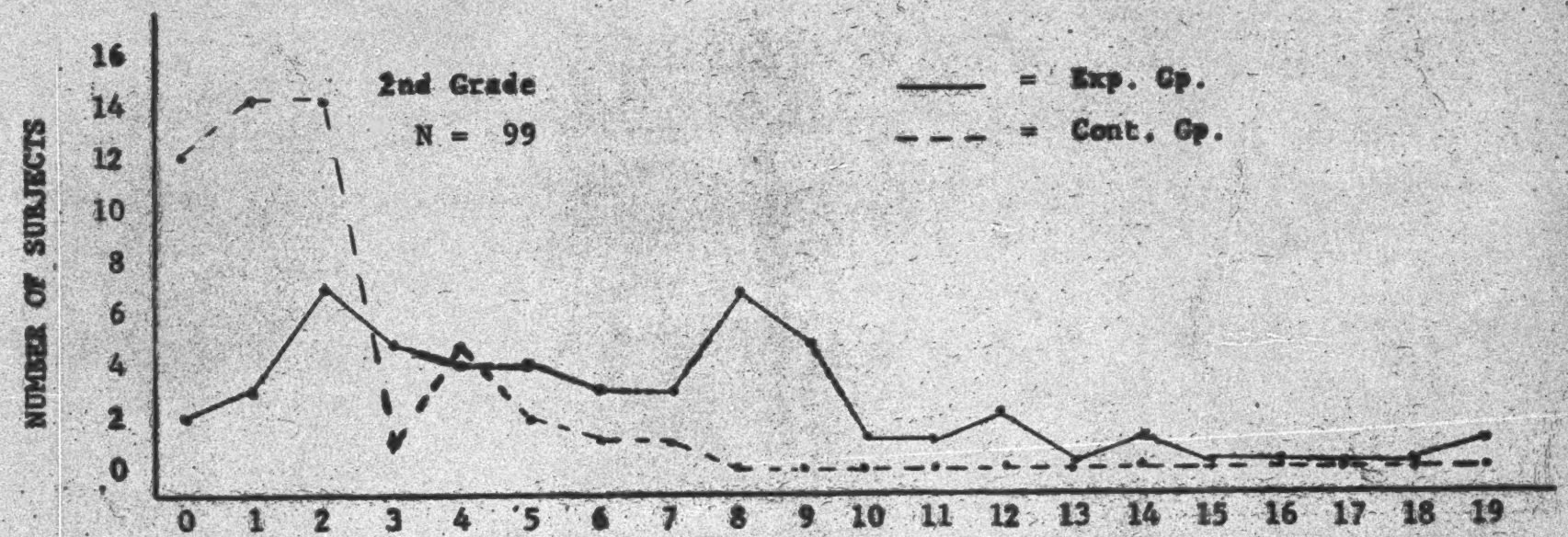
These findings indicate a very clear delineation of 2 groups within our maladjusted group. The high dysfunction group show test signs of poor skills necessary for adaptation to the environment, especially at school. This is the group that we suggest show behavioral maladjustment secondary to the problems they have in coping with the demands of the environment. The low dysfunction group does not give evidence of poor skills and may be considered representative of those children with primary emotional difficulties arising from adverse environmental influences.

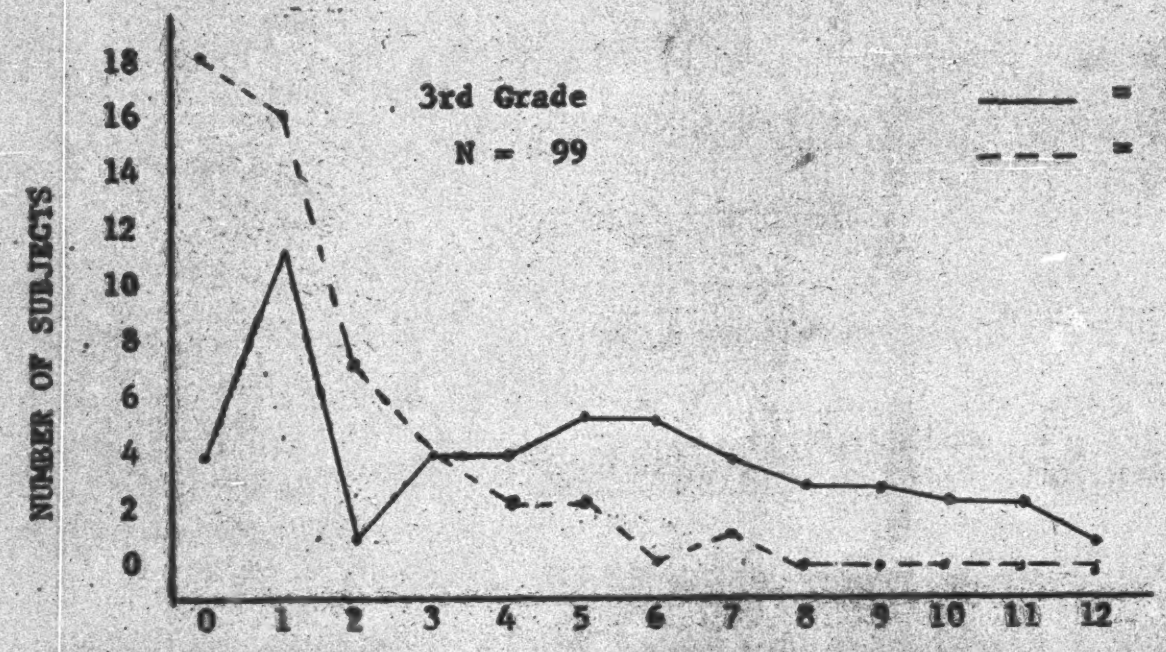
When the total first grade experimental and control groups were compared for Full Scale I.Q., it was found that the experimental group was lower although both fell within

Figure 4

DISTRIBUTION OF COGNITIVE-MOTOR DYSFUNCTION SCORES







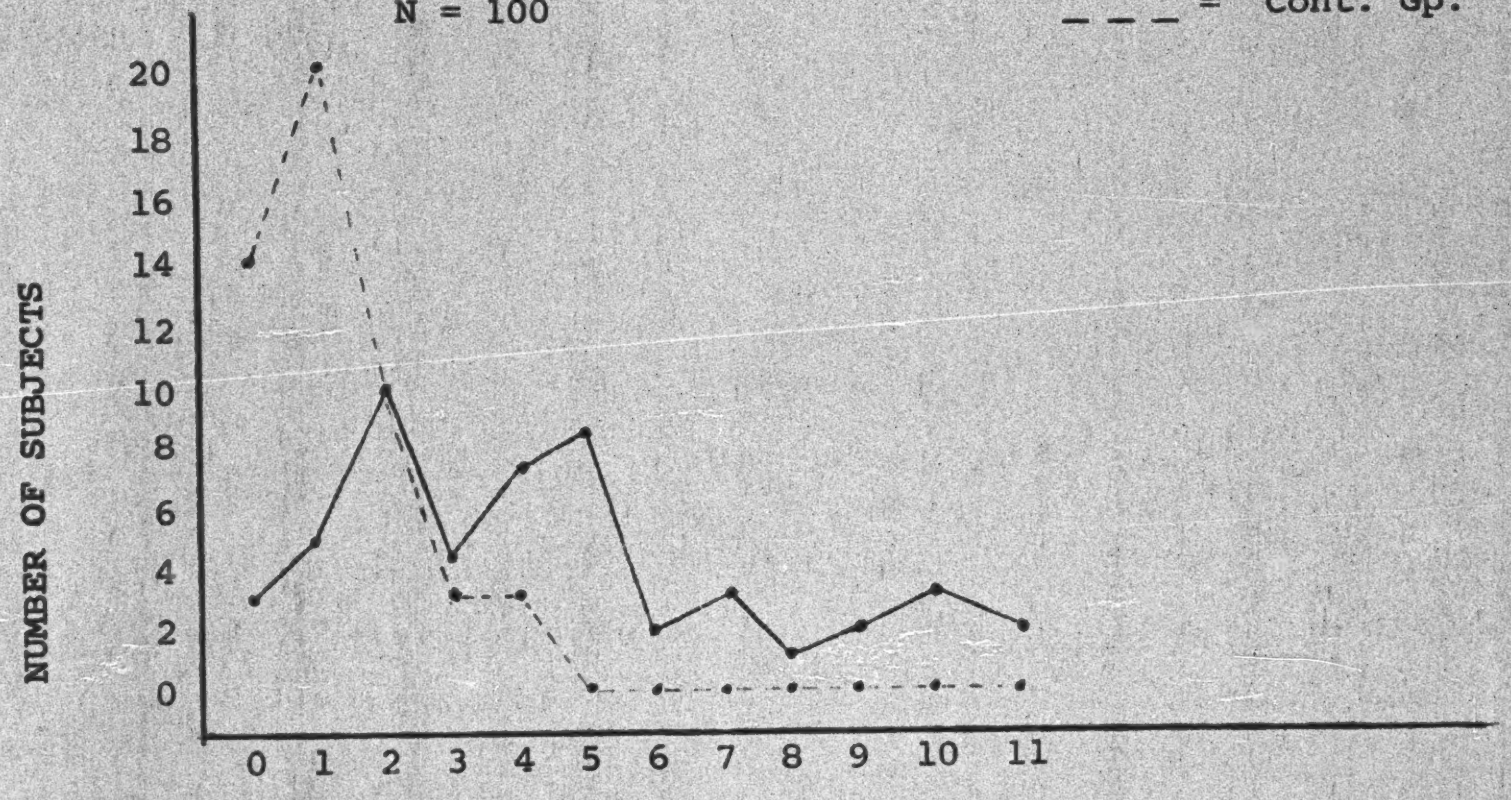
TOTAL COGNITIVE-MOTOR DYSFUNCTION SCORE

Figure 4 (continued)

DISTRIBUTION OF COGNITIVE-MOTOR DYSFUNCTION SCORES

5th grade

N = 100



the average range. High and low cognitive dysfunction groups differ slightly in I.Q., more pronouncedly on non-verbal I.Q. (Table 2.) It is likely that 1st grade children with high cognitive-motor dysfunction scores do poorly on I.Q. tests, especially on non-verbal items. Of the 24 items contributing to the cognitive-motor dysfunction score, over half of these also measured perceptual and motor skills.

Table 3 compares high and low dysfunction experimental subjects on ratings of behavior. Although the two groups are different on total score for behavioral maladjustment, there is also a difference between the two groups on four items from the Checklist that relate to disoriented behavior. These findings suggest that there is a relationship between certain types of behavior maladjustment, especially disoriented behavior, and cognitive-motor performance.

Finally, the findings indicate an association between cognitive-motor dysfunction and academic difficulties for all groups except the 5th which was not available at this time. In Table 4, high and low dysfunction groups are compared on their performance on the Metropolitan Achievement Test. Subjects from the 1st grade experimental group showing high cognitive-motor dysfunction are showing slightly more academic retardation than the low dysfunction group. This trend is clearly seen when second and third grade groups are compared, where achievement measurement is more reliable.

CONCLUSIONS

The findings from this first report on a study of cognitive-motor functioning and its relationship to academic and behavior problems on 400 school age children gives strong evidence to support the view that children showing maladjustment in school are made up of at least two sub-groups not different from each other in overall behavioral maladjustment but identified by their difference in performance on tasks involving cognitive-motor functioning. There is a tendency for those with poor cognitive-motor abilities to show more symptoms associated with disoriented behavior. Furthermore, individuals showing both behavior maladjustment and academic retardation are likely to be those who do poorest on tests of cognitive-motor functioning.

It is apparent that methods of identification of children with emotional maladjustment should include references to

Table 2

Comparison of High and Low Cognitive-Motor Dysfunction Groups

on WISC I.Q.

First Grade Experimental Groups

	HIGH DYSFUNCTION		LOW DYSFUNCTION		
	Males (16)	Females (4)	Males (14)	Females (16)	
Verbal I.Q.	94.4	94.3	98.3	96.4	n.s.
Performance I.Q.	98.3	104.5	106.7	104.9	n.s.
Full Scale I.Q.	96.0	99.0	102.4	100.3	n.s.

Table 3

Comparison of High and Low Dysfunction Groups

on Behavior Symptoms

First Grade Experimental Group

	Total Behavior Checklist	Sum of Behavior Checklist "Disoriented Items" *
High Dysfunction N = 20	16.8	5.7
Low Dysfunction N = 30	10.8	3.0
	$P < .05$	$P < .05$

* Behavior Checklist Items 15, 22, 28 and 29.

Table 4

Comparison of High and Low Dysfunction Groups

on Academic Achievement

	Metropolitan Achievement Test Average Total Score *		
	1st Grade (N = 48)	2nd Grade (N = 49)	3rd Grade (N = 49)
High dysfunction	-.37	-.53	-.44
Low dysfunction	-.11	+.01	+.38
	P < .05	P < .01	P < .05

* This score is the difference between chronological age grade placement and grade achievement on the total M.A.T.

behavior reflective of poor cognitive-motor functioning. The kind and type of programming, including both remedial work and treatment, should be related to the type of disorder determined by comprehensive assessment procedures. Individuals showing marked cognitive-motor dysfunction in the presence of school maladjustment would need a special educational programming that would be corrective in the areas of dysfunction(2). It is less likely that psychological treatment methods alone could be expected to be successful with this group although it is apparent that these children do experience secondary emotional problems. Evaluation of programs of stimulation retraining in areas of dysfunction is the current phase of the Lafayette Clinic Cognitive-Motor Research Project.

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